PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Combustion Technologies

02/2003

CO-FIRING TIRE-DERIVED FUEL ADVANCED COMBUSTION SYSTEMS

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PARTICIPANTS

JanRT Tire Recycling Equipment, LLC
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CUSTOMER SERVICE

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WEBSITE

www.netl.doe.gov/coalpower/combustion/

Description

To help mitigate the nation's scrap tire problem, a Cooperative Research and Development Agreement (CRADA) was created between NETL and two small businesses: JANRT Tire Recycling Equipment, LLC of Muncie, Indiana and Mary Ellen Corporation of Bridgeport, West Virginia. This CRADA was awarded to develop and demonstrate a prototype portable tire chipper which would turn scrap tires into small pieces of rubber to be used as supplemental fuel to co-fire with coal in Fluidized-Bed Combustion Systems (FBC) and other types of furnaces. Tire chips have been shown to enhance the combustion of these systems rendering them more efficient. As such, it is a highly desirable additive for coal-fired systems.

Scrapped tires are currently a significant environmental problem. In the U.S. alone:

- 281,000,000 tires are discarded annually, one for every man, woman, and child.
- 23 percent of these scrap tires are stockpiled, or just dumped.

Stockpiled and dumped tires are an unsightly breeding ground for mosquitoes and play a key role in sustaining the threat to public health brought about by the diseases spread by mosquitoes. In addition, the tire piles are considered a severe fire hazard which could potentially burn out of control. In the past, some large scrap tire fires have burned for weeks resulting in tremendous amounts of toxic air pollution.

This CRADA, in which the partner receives no Federal funds but agrees to match Federal expenditures in order to achieve a common goal, would study the commercial feasibility of a portable trailer-mounted tire chipping system. NETL is currently evaluating the economic merits of co-firing these tire chips.

Co-Firing Tire-Derived Fuel Advanced Combustion Systems

Benefits

The potential benefits of the CRADA and co-firing tire-as-fuel are four fold:

- A viable economic solution to a serious environmental problem (tire piles) is offered.
- Business opportunity for CRADA partners and other small business as well as power producers is created.
- The use of coal is enhanced with respect to stabilized, more efficient combustion and lower net emissions per BTU.
- A low cost fuel additive / enhancer is made available to suitable coal-fired systems.

This Project CRADA helps communities to recycle its worn tires, and avoid the current environmental problems they cause. Recycling tires in this manner provides a renewable electricity source.

Tire collection fees and sale of the tire-derived chipped fuel offset the cost to chip and deliver them to the power plant. There is potential for a small business to be developed around this CRADA-derived product.

Circulating Fluidized-Bed Combustion Systems (CFB) and many other conventionally fired solid combustion furnaces can co-fire chipped tires, so long as the proportion of chips is under about 20 percent of the Btu load to the boiler. Tires make an outstanding clean fuel for electric power generation. In furnaces with proper combustion control, scrap tire chips: undergo controlled combustion and do not generate the toxic fumes associated with open burning of tire piles, provide a high energy content fuel (~14,000 BTU/lb), and stabilize the coal combustion process.

The use of tire chips is so efficient at stabilizing the combustion process in furnaces that utilize inconsistent low-grade solid fuel that is a preferred approach. Boiler efficiency may increase slightly when chipped tires are burned.

Product of the CRADA

- Prototype of mobile tire chipping equipment designed and constructed.
- Demonstration of equipment via a local route which processes and delivers tire to an end user.
- An economic analysis of the proposed mobile process.
- An evaluation of the equipment and environmental permit modifications necessary to co-fire tire as fuel.
- Assistance in the communication of the benefits of tire recycling.

Technical Readiness

The primary risk for the project is assuring that the mobile tire shredding equipment and the manner is which it is used will result in an adequate return on investment for the owner and operator of the system. The economics of the system depend highly on the proximity in which the mobile equipment must travel to process the tires and transport the tire derived fuel to the end user as well as the fees to processing the tire and purchase price of the fuel. Technical risk for making mobile chipping equipment is low. Co-firing chipped tires has proven successful, and the feed and combustion control needed are known. Full-scale testing is needed to work out the equipment and infrastructure influences on overall economics. The mobile chipper system is in detail design, and fabrication is underway. Soon, the chipping testing will begin. After that, combustion co-firing testing will take place. With success, a new business will be launched.